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Determinants of Basic Immunization Coverage: The Role of Family Knowledge and Support in Central Sulawesi, Indonesia

Abustam[1], Tariq Ullah[2]

[1] Community Health Center, Banggai District, Central Sulawesi, Indonesia
[2] Dow University, Pakistan, Karachi, Pakistan

Corresponding Author's: Abustam, abustaan134@gmail.com

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ABSTRACT

Background: Indonesia continues to face challenges in achieving optimal immunization coverage, especially in rural and underserved regions. In Central Sulawesi, incomplete basic immunization among children remains prevalent despite government programs. This study aimed to investigate the role of maternal knowledge and family support in predicting complete basic immunization coverage among children aged 1–5 years in Toili II Community Health Center, Banggai Regency.
Methods: A cross-sectional correlational study was conducted in August 2024 using a non-probability sampling method. A total of 53 mothers participated. Data were collected using validated and reliable questionnaires measuring maternal knowledge (18 items) and family support (15 items). Immunization status was verified using vaccination cards. Data analysis involved descriptive statistics, bivariate Chi-square tests, and multivariate logistic regression.
Result: Results showed that 64.2% of children had complete immunization. Nearly half of the mothers had moderate knowledge (49.1%) and moderate family support (39.6%). Logistic regression revealed that both maternal knowledge ($p < 0.001$) and family support ($p < 0.001$) were significant independent predictors of complete immunization. Together, they explained 85.9% of the variance in immunization status.
Conclusion: This study concludes that maternal knowledge and family support significantly and synergistically influence childhood immunization completeness. Health promotion strategies should integrate family-based education and support systems into immunization programs, particularly in rural areas. Frontline health workers are encouraged to assess both knowledge and perceived support during routine visits. Policymakers should consider embedding family-engagement modules in immunization guidelines and leveraging household dynamics to strengthen national immunization coverage.

Keywords: Immunization, Knowledge, Family Support, Vaccination, Rural Health

Practice Implications

1. Involve spouses and family members in immunization counselling to strengthen maternal support and vaccine adherence.
2. Use quick assessments of maternal knowledge and family support to identify children at risk for incomplete immunization.

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3. Embed family support tools such as checklists and leaflets into routine immunization services to improve coverage with minimal added workload.

Introduction

The health development agenda in Indonesia is currently facing a double burden of disease, encompassing both communicable and non-communicable diseases. Among these, vaccine-preventable infectious diseases remain a major concern, especially in remote and underserved regions. Immunization is recognized globally as one of the most cost-effective public health interventions for preventing the spread of infectious diseases across administrative boundaries (Ministry of Health Regulation No. 12/2017). Indonesia's immunization program, integrated into its broader commitment to the Sustainable Development Goals (SDGs), specifically aims to reduce child mortality by preventing diseases such as tuberculosis, diphtheria, pertussis, measles, polio, tetanus, and hepatitis B (Gilbert, 2024)(Perin *et al.*, 2022).

Despite long-standing governmental initiatives, immunization coverage in Indonesia remains suboptimal. According to the 2018 Indonesian Basic Health Research, 32.9% of children had incomplete basic immunizations, and 9.2% had not been immunized at all. The World Health Organization also reported that globally, while 2–3 million deaths are averted annually through immunization, 22 million infants still lack complete immunization coverage, with approximately 9.5 million of these residing in Southeast Asia, including Indonesia. In Central Sulawesi, the regional immunization coverage was only around 50% in 2018, falling below national targets (Riskesdas, 2018).

Preliminary findings Community Health Center in Banggai Regency, Central Sulawesi, revealed that only 71% of children had complete immunization status. Of 60 children observed, 14 had incomplete immunization. Interviews with mothers of incompletely immunized children indicated various contributing factors: 50% cited being too busy, 30% lacked knowledge regarding immunization schedules, and 20% admitted forgetting. These findings align with previous studies that underscore the significant role of parental—especially maternal—knowledge, attitudes, and family support in determining immunization behaviors (Davies *et al.*, 2021; Langer *et al.*, 2024)

However, existing studies have primarily focused on general determinants of immunization uptake, often in urban or more accessible regions, without adequately addressing the interaction between family knowledge characteristics and social support within rural or peripheral primary care settings. The dynamics of immunization adherence in these remote areas may differ significantly due to local socio-cultural norms, limited access to healthcare, and varied levels of health literacy (Yigit *et al.*, 2021; Regazzi *et al.*, 2022; Ding *et al.*, 2024).

Despite the acknowledged importance of family-related factors in immunization adherence, there is limited research that specifically explores how both knowledge and familial support characteristics jointly influence immunization status in rural Indonesian contexts, particularly in

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underserved areas such as Toili II in Central Sulawesi Indonesia. Most studies to date have treated these variables independently or have not contextualized their interaction in localized healthcare delivery frameworks.

The novelty of this study lies in its integrative examination of family knowledge and support as dual predictors of primary immunization status at a community health center located in a geographically and socioeconomically vulnerable region. By focusing on a real-world health service delivery setting with documented suboptimal coverage, this study provides localized evidence to inform targeted public health interventions and community engagement strategies.

Methodology

Study Design.

A quantitative, cross-sectional correlational design was employed to examine the relationship between maternal knowledge, family support, and primary immunization status among children aged 1–5 years in the Toili II Community Health Center, Banggai Regency, Central Sulawesi, Indonesia (August 2024).

Participants.

A consecutive non-probability sampling strategy was applied: every mother who brought a child to the health center during the study period and met the inclusion criteria was invited until the required number was reached. Inclusion criteria were: (1) mother is the primary caregiver; (2) child aged 1–5 years; (3) residence within the Toili II catchment area; and (4) willingness to provide informed consent. Exclusion criteria were: (1) mothers unable to communicate in Indonesian; (2) children with medical contraindications to vaccination. Sixty (N = 60) respondents constituted the final sample. A formal power analysis was not feasible because no prior local effect-size estimates existed; instead, the sample size was justified by the total number of eligible mother–child pairs attending the clinic over one immunization cycle, ensuring adequate representation of the setting.

Instrument.

Two researcher-developed questionnaires were used after minor adaptation from the Indonesian Ministry of Health immunization guidelines: (i) Maternal Knowledge Scale (18 dichotomous items covering Hepatitis B, OPV, BCG, Measles, Hib, and DPT-HB-Hib schedules), and (ii) Family Support Scale (15 dichotomous items assessing emotional/esteem, informational, and instrumental support). Content validity was confirmed by three public-health experts (Item-level CVI = 0.87). Construct validity was established via Pearson product-moment correlations ($r = 0.41–0.79$, $p < 0.05$). Reliability testing in a pilot sample at Toili I Health Center yielded Cronbach's $\alpha = 0.82$ (knowledge) and 0.85 (support). Permissions for adaptation were obtained from the original guideline authors. Scores were converted to percentages and classified as Good (≥ 75 %), Moderate (56–74 %), or Poor (≤ 55 %). Immunization status (Complete = 2; Incomplete = 1) was verified against each child's vaccination card.

Data Collection.

Data were gathered on-site during regular clinic hours in August 2024. The principal investigator and two trained nursing

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enumerators administered questionnaires face-to-face in a private room and cross-checked vaccination cards immediately after the interview.

Data Analysis.

Data were entered and cleaned in Microsoft Excel, then analyzed using SPSS version 26. Descriptive statistics summarized participant characteristics. Bivariate relationships between independent variables and immunization status were examined with Chi-square tests, and variables with $p < 0.25$ were entered into a multivariate logistic regression model to identify independent predictors ($\alpha = 0.05$).

Ethical Consideration.

Ethical approval was obtained from the Ethics Committee of the Faculty of Health IIK Strada. Written informed consent was secured from all participants prior to data collection. Confidentiality was maintained by de-identifying data and restricting access to the research team only.

Results

Table 1 illustrates A total of 53 mothers of children aged 1–5 years were included. Most respondents were 26–35 years old, had completed senior high school, and were homemakers (Table 1).

Table 1. Socio-demographic profile of respondents (N = 53).

Characteristic	Category	n	%
Age (years)	17–25	5	9.4
	26–35	35	66
	36–45	13	24.5
Education	No formal schooling	3	5.7
	Primary (SD)	5	9.4
	Junior high (SMP)	10	18.9
	Senior high (SMA)	29	54.7
	Tertiary (PT)	6	11.3
Occupation	Employee	22	41.5
	Self-employed	5	9.4
	Homemaker	26	49.1

Almost half of the mothers demonstrated moderate knowledge and family support levels. Two-thirds of children had complete immunization (**Table 2**).

Table 2. Distribution of knowledge, family support, and immunization status (N = 53).

Variable	Category	n	%
Maternal knowledge	Poor	13	24.5
	Moderate	26	49.1
	Good	14	26.4
Family support	Poor	16	30.2
	Moderate	21	39.6
	Good	16	30.2
Immunization status	Incomplete	19	35.8
	Complete	34	64.2

Maternal knowledge and family support were jointly entered into a binary logistic model predicting complete immunization (Table 3). The model fit was acceptable (–2 LL = 17.043; Nagelkerke R^2 = 0.859), explaining 85.9 % of the variance. Both predictors were significant: higher knowledge (Wald = 17.29, $p < 0.001$) and stronger family support (Wald = 34.79, $p < 0.001$) increased the odds of complete immunization.

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Table 3. Logistic regression predicting complete immunization (N = 53). β coefficients collapsed by SPSS due to iteration limit; Wald statistics and significance shown.

Predictor	β	SE	Wald	p-value	Exp(β)
Maternal knowledge	—	—	17.29	< 0.001	—
Family support	—	—	34.79	< 0.001	—
Constant	0.582	0.286	4.13	0.042	1.79

Table 3 illustrates the findings of this study revealed that mothers with good knowledge about immunization were significantly more likely to have children who received complete basic immunization. This suggests that a higher level of understanding regarding the types, schedules, and benefits of vaccines strongly influences maternal behavior toward ensuring their child's immunization is up to date. In addition, family support—encompassing emotional encouragement, informational guidance, and instrumental assistance—also played a critical independent role in predicting complete immunization. Mothers who received adequate support from family members were more empowered and better equipped to follow through with immunization schedules. When analyzed together, these two factors—maternal knowledge and family support—explained 85.9% of the variance in immunization status. This high predictive value highlights their combined importance and underscores the need for health promotion strategies in rural Indonesian settings to focus on both improving maternal knowledge and strengthening familial support systems to increase immunization coverage.

Discussion

This study highlights the interplay between maternal knowledge, family support, and the completeness of basic immunization status among children in the working area of the Toili II Public Health Center, Central Sulawesi. The findings underscore the crucial role of both cognitive and social domains in shaping maternal health behavior, particularly in adherence to child immunization schedules. The analysis supports the assertion that health knowledge and family environment function as enabling factors that influence health decision-making among mothers (Anand *et al.*, 2023; Elbert *et al.*, 2023).

From a behavioral health perspective, the maternal decision to complete basic immunization appears not solely dependent on healthcare system access, but also on the mother's internalized knowledge and the reinforcement from her immediate social environment. The results align with earlier research suggesting that knowledge and emotional maturity, often associated with maternal age and education level, are positively correlated with immunization uptake. Additionally, the significance of family support, especially from spouses and extended family members, adds a contextual dimension to immunization behavior that is often underrepresented in quantitative models (Ma *et al.*, 2023; Saidu *et al.*, 2023).

Although various studies have identified maternal knowledge and attitudes as predictors of immunization behavior, few have examined the combined effect of knowledge and family support as interactive determinants within a rural Indonesian context. This study contributes a novel perspective by integrating these

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two variables through a logistic regression framework, offering empirical evidence that both knowledge and familial dynamics significantly co-determine immunization status. Moreover, the incorporation of qualitative insights on how family members emotionally and informationally support mothers provides an enriched sociocultural understanding of immunization practices, a dimension often overlooked in previous public health studies focused predominantly on structural barriers (Cataldi and O'Leary, 2021; Zastawna *et al.*, 2023).

Furthermore, the findings provide a unique viewpoint from a region with distinct cultural and geographical attributes—Central Sulawesi—which remains underrepresented in national immunization discourse. This study serves to localize the immunization challenge, recognizing the sociocultural mechanisms that could be leveraged to improve coverage in underserved communities.

This study reinforces the Health Belief Model (HBM) and Social Cognitive Theory (SCT) by empirically demonstrating that perceived benefits of immunization (knowledge) and social support (subjective norms) significantly influence health behavior (Mehrabizadeh *et al.*, 2024)(Alyafei and Easton-Carr, 2025)(Parwati *et al.*, 2021). It extends existing theoretical frameworks by positioning family dynamics not merely as contextual modifiers, but as active behavioral determinants capable of facilitating or inhibiting maternal action.

One of the more compelling findings is the reported emotional support from family members—such as spouses accompanying mothers during immunization sessions or providing verbal encouragement—suggesting that immunization decisions are deeply embedded in relational dynamics. Additionally, despite adequate knowledge, the persistence of incomplete immunization implies the presence of cognitive-behavioral dissonance, potentially stemming from vaccine myths, fear of side effects (e.g., post-immunization fever), or social misinformation. These nuances reflect a gap between knowledge acquisition and behavioral execution, revealing the complexity of immunization compliance (Qin *et al.*, 2022; Zambri *et al.*, 2022; Rapheal *et al.*, 2023).

This study is not without limitations. First, it employs a cross-sectional design, which restricts causal inference regarding the relationships observed. Second, the self-reported nature of the data may introduce recall bias or social desirability bias, particularly when respondents are asked to report their knowledge or describe the extent of family support. Third, the absence of health system factors such as service availability, health worker engagement, and vaccine supply logistics limits the generalizability of the findings beyond the socio-familial scope.

Moreover, the study did not explore the role of digital or community-based sources of health information, which may have contributed to shaping maternal perceptions. Future studies could adopt a longitudinal mixed-method approach to trace how knowledge and support evolve over time and affect immunization adherence.

Practical Applications of the Findings

The study's findings can be applied in several practical ways to strengthen immunization efforts. First, front-line health workers can use a quick two-step

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screening tool—assessing maternal immunization knowledge and perceived family support—to identify families at risk of incomplete vaccination and prioritize them for follow-up. Second, primary care facilities can integrate short, structured family-engagement modules, such as spouse-inclusive counselling and take-home leaflets, into routine immunization visits. Third, adding family-support indicators to existing maternal–child health registers enables early intervention with minimal additional workload. Lastly, district health offices can develop continuing education programs focused on family-oriented communication, while policymakers can link support indicators to national monitoring systems to guide planning and budget decisions..

Conclusion

This study met its objectives by demonstrating that both maternal knowledge and family support independently—and, more importantly, synergistically—shape the completeness of basic childhood immunization in a rural Indonesian context. These findings confirm the working hypothesis that cognitive and social determinants jointly predict vaccination uptake and deepen our understanding of how household dynamics influence preventive care. Primary-care programmes should incorporate family-inclusive education and routinely assess perceived support to enhance immunization coverage. Future research should adopt longitudinal or mixed-methods designs to explore how changes in knowledge and support over time translate into sustained vaccination adherence. Policymakers are encouraged to embed family-support metrics into national immunization dashboards and to fund community outreach that actively involves spouses and grandparents in vaccine-promotion activities.

Authors Contributions

Conceptualization: Abustam, Tariq Ullah
Data curation: Abustam
Formal analysis: Tariq Ullah
Funding acquisition: Abustam
Investigation: Abustam, Tariq Ullah
Methodology: Tariq Ullah, Abustam
Project administration: Abustam
Resources: Abustam
Software: Tariq Ullah
Supervision: Tariq Ullah
Validation: Abustam, Tariq Ullah
Visualization: Tariq Ullah
Writing – original draft: Abustam
Writing – review & editing: Tariq Ullah

Conflicts Of Interest

The Authors Declare No Conflict Of Interest.

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